



AQUAculture USEr driven operational Remote Sensing information services



Welcome

Dear reader,

We welcome you to the newsletter of AQUA-USERS! AQUA-USERS is an FP7-funded project that aims at turning Earth observation data into services providing user-relevant and timely information for the aquaculture industry.

We have taken the liberty of sending you this first issue of our new newsletter. Every half year we will feature project news, new publications, upcoming events and put one of the members of our user board in the spotlight. If at any time you wish to unsubscribe, please use the unsubscribe link at the bottom of this and every issue.

In this first edition you will

- learn more about the background and aims of the AQUA-USERS project
- find out about the method development taking place for harmful algal bloom detection and aquaculture indicators
- be introduced to the technical infrastructure being developed, and
- meet Hortimare, an innovative company from the Netherlands developing efficient, circular and sustainable concepts for (seaweed) aquaculture



We hope that you'll enjoy our updates!

Marnix Laanen, Water Insight, coordinator, and the AQUA-USERS team

About AQUA-USERS



AQUA-USERS will provide the aquaculture industry with user-relevant and up-to-date information based on the most up-to-date satellite data and innovative optical in-situ measurements. The key purpose is to develop an application that brings together satellite information on water quality and temperature with in-situ observations as well as relevant weather prediction and met-ocean data. The application and underlying database will be linked to a decision support system that includes a set of (user-determined) management options. Specific focus will be put on the development of indicators based on Earth observation data for aquaculture management including indicators for harmful algae bloom events. The methods and services developed within AQUA-USERS will be tested by the members of the user board, 8 aquaculture companies and organisations, which represent different geographic areas and aquacultural production systems.

For more information, see the [AQUA-USERS website](#) and follow us on [Twitter!](#)

Project news

Project meeting Bergen June 2014

At the beginning of June, 14 members of the AQUA-USERS team gathered in Bergen, Norway, to discuss the progress of the project and plan the work for the upcoming half year.

Lively discussions took place on the best methods to detect algae species, on in-situ and satellite data and their quality control, on management options for aquaculture operators and how to evaluate them. One day of the meeting was held at Hardanger Akvasenter, a salmon show farm, where those of the project team not familiar with salmon aquaculture could learn a lot about the practical issues of salmon farming (and all could enjoy some very tasty salmon dishes!).



Method development

The main focus of method development within AQUA-USERS is currently on aquaculture indicators and harmful algal bloom detection.

Aquaculture indicators

For developing aquaculture indicators, historical information of bloom occurrence for each region is analysed with a consistent historic satellite data set. Threshold alert levels for chlorophyll, sea surface temperature and other parameters are developed for each region, taking into account the characteristic regional conditions. Also, the understanding of bloom phenology is improved by a statistical analysis on the long time series of satellite data.



Detection of harmful algal blooms (HABs)

Detecting the presence or absence of algae by the proxy of chlorophyll-a can be considered as a mature technique by now. However, most aquaculture operators are not simply interested in the presence or absence of algae, but in particular harmful species. Detecting species or groups of species with optical methods is cutting-edge research. Within AQUA-USERS, a number of techniques are used to further develop these methods. On the one hand, an empirical classifier for satellite images developed by PML is trained with additional concurrent species count data provided by the project partners and user. On the other hand, algae species are cultured and their optical characteristics measured in the lab. From these measurements, reflectance spectra are modelled, which are subsequently used to develop hyperspectral detection algorithms. The first algae that will be taken on are species of *Pseudo-nitzschia*, *Gymnodinium* and *Phaeocystis*.

Technical development

At the same time, the AQUA-USERS team is setting up the technical infrastructure to provide the users with operational services and an enjoyable user experience. For site selection, an archive of at least 10 years of satellite data on water quality and sea surface temperature is set up. Current and historic in-situ measurements are stored in a database. A web portal and a mobile app will allow the users to interactively explore both the satellite and in-situ measurements. In addition, a module is set up for decision support, which will allow the users to store and evaluate management options under given environmental conditions.

WISP-3 measurements

While the method development and technical implementation are ongoing, the partners and users of AQUA-USERS are already busy taking in-situ measurements with their WISP-3 instruments. The Water Insight Spectrometer (WISP-3) is an easy to operate hand-held instrument to scan surface water quality. It provides measurements of the spectral reflectance and inherent optical properties as well as derived water quality parameters (Chl-a, TSM, CDOM and Kd).

These data provide a wealth of information for algorithm calibration and validation, and continuity of information collection during cloudy days / days without satellite overpass. The second of the three case studies within AQUA-USERS focuses specifically on using the WISP-3 for day-to-day management decisions in aquaculture. Up to now, the AQUA-USERS partners and user have collected over 400 measurements and counting!



User in the spotlight: Hortimare



The Dutch company Hortimare was founded in 2008 by entrepreneur Job Schipper to develop efficient, circular and sustainable concepts of aquaculture. In these systems, seaweeds are the renewable and eco-neutral sources of marine proteins and the floating seaweed production field develops into a biodiverse, stabilising ecosystem supporting sustainable salmon farming. By producing seaweeds (macro algae) next to salmon farms in the Norwegian fjords the high levels of phosphorous and nitrogen can be reduced while providing a habitat for predators of salmon lice. Hortimare has three main fields of activity: A Seaweed Genetics and Hatchery (G&H) where they develop and sell seaweed juveniles, bred for high contents and yields of marine proteins, mannitol, alginate and bio-active ingredients. With their Integrated Aquaculture Service (IAS) they supply the service to produce seaweed in the direct neighbourhood of salmon farms. The seaweeds absorb significant amounts of the valuable nutrients from the farm and are rich in proteins, mannitol and other ingredients. Thereby, they help salmon farmers in restoring the marine ecosystems by improving bio-diversity

and combat sea lice. The harvest of seaweed is sold to their Seaweed Bio-Refinery Plant (BRP) where they process and refine the seaweed and produce high quality protein for feed and food applications (amongst others: feed for salmon) plus compounds for the global chemical-, pharmaceutical and nutraceutical markets.

First successful production by Hortimare in Norway using a cultivation infrastructure was realized in 2010. In May 2014, a total of 3.5 ton biomass has been harvested on this Norwegian site. From AQUA-USERS Hortimare expect support in the selection of new sites by detailed spatial datasets of relevant factors, and indicators to help determine the best time for harvest. To determine the optimal harvest time, it is important to monitor both the biomass development of the seaweed and the environmental conditions that determine the onset of biofouling by encrusting bryozoans as this process reduces both the biomass and the economic value of the seaweed.

For more information on Hortimare, visit their [website](#).

Upcoming events

AQUA-USERS will be presented at a number of upcoming conferences:

- **15-19/09/14 ICES Annual Science Meeting 2014** (A Coruña, Spain): AQUA-USERS poster presentation by Ana Amorim of FCUL. [For details, see event web site.](#)
- **4-17/10/2014 European Aquaculture Society 2014** (Donostia-San Sebastian, Spain): Poster presentation by Bruno Fragoso of Sagremarisco. [For details, see event web site.](#)
- **26-31/10/14 Ocean Optics XXII** (Portland, Maine, US): Oral presentation "Deriving Aquaculture indicators from Earth Observation in the AQUA-USERS project (AQUAculture USEr driven operational RemoteSensing information Services)" by Vanda Brotas of FCUL. [For details, see event web site.](#)
- **28-30/10/14 7th EuroGOOS conference "Operational Oceanography for Sustainable Blue Growth"** (Lisbon, Portugal): AQUA-USERS poster presentation by Kai Sørensen of NIVA. [For details, see event web site.](#)
- **21/11/2014 Mares Conference 2014** (Olhão, Portugal): Poster presentation by John Icely of Sagremarisco. [For details, see event web site.](#)

We are looking forward to meeting and discussing with interested parties. If you are attending these events, stop by and say hello!

New Publications

In the last few months, the members of AQUA-USERS consortium have (co-)authored a number of scientific publications relating to monitoring water quality and algal blooms:

Cristina, S.C.V., Moore, G.F., Goela, P.R.F.C, **Icely, J.D.** & Newton, A. (2014) [In situ validation of MERIS marine reflectance off the southwest Iberian Peninsula: assessment of vicarious adjustment and corrections for near-land adjacency](#). International Journal of Remote Sensing, 35(6): 2347-2377.

Eleveld, M.A., van der Wal, D., & van Kessel, T (2014) [Estuarine suspended particulate matter concentrations from sun-synchronous satellite remote sensing](#): Tidal and meteorological effects and biases. Remote Sensing of Environment, 143: 204-215.

Groetsch, P.M.M., Simis, S.G.H., **Eleveld, M.A.** & **Peters, S.W.M.** (2014) [Cyanobacterial bloom detection based on coherence between ferrybox observations](#). Journal of Marine Systems, Available online 3 June 2014.

Kurekin, A.A., **Miller, P.I.** & **Van der Woerd, H.J.** (2014) [Satellite discrimination of *Karenia mikimotoi* and *Phaeocystis* harmful algal blooms in European coastal waters: Merged classification of ocean colour data](#). Harmful Algae, Volume 31: 163-176.

Miller, P.I. & Christodoulou, S. (2014) [Frequent locations of oceanic fronts as an indicator of pelagic diversity: Application to marine protected areas and renewables](#). Marine Policy, 45: 318-329.

Muacho, S., da Silva, J.C.B., **Brotas, V.**, Oliveira, P.B. & Magalhães, J.M. (2014) [Chlorophyll enhancement in the central region of the Bay of Biscay as a result of internal tidal wave interaction](#). Journal of Marine Systems, 136:22-30.